

Ka-Band Electronically Steered CubeSat Antenna, Phase II

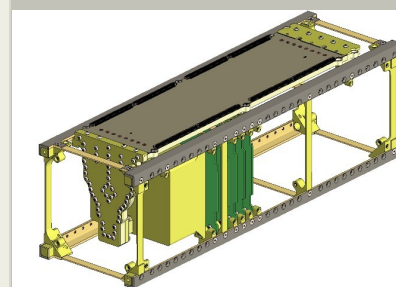
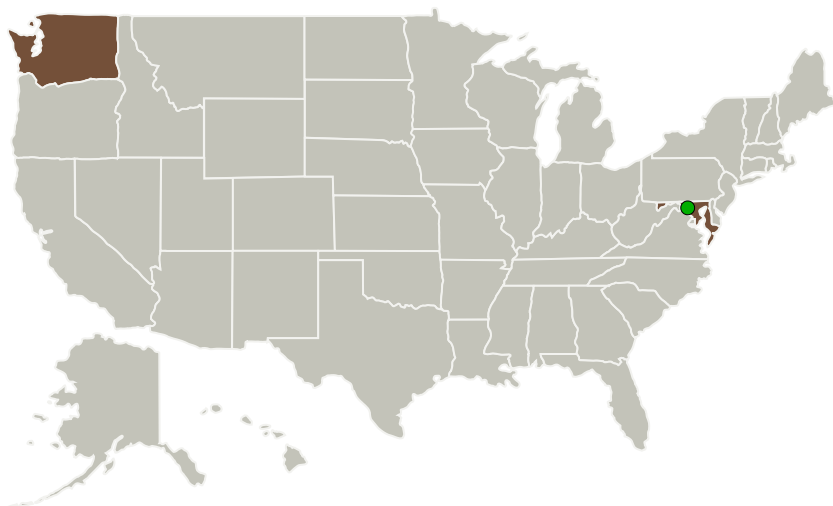
Completed Technology Project (2017 - 2018)



Project Introduction

Kymeta Government Solutions (KGS) designed, analyzed, built, tested, and delivered a small, lightweight, low-cost, low-power electronically steered Ka-band prototype antenna subsystem module (ASM) intended for use on 3U or larger CubeSats. This antenna uses a tunable dielectric material and an array of radiating elements to create an interference pattern that steers the beam in the desired direction. This method provides moderate gain without the use of mechanical steering and similar functional performance to a traditional phased array at a fraction of the size, weight, power, and cost (SWAP-C). The Ka band ASM is specifically designed to be a flexible component in the communications chain. All of the interfaces to the ASM are simple, non-proprietary interfaces, and the KGS ASM is agnostic to radio, waveform, and network selections. A receiver can be readily integrated with the ASM to enable closed loop tracking, and the simple command interface of the ASM provides the communication system with the ability to easily and rapidly refine the beam position to maximize gain and ultimately improve link margins and data throughput without incurring additional power draw or mechanical stability effects. Modifications to the aperture to better integrate, survive launch, and operate in space were designed during Phase I; during Phase II, KGS plans to update the control electronics and software that drive the antenna and then build and perform RF test on the overall system to verify compliance with requirements. To date, a low-SWAP Ka-band steerable antenna for small satellites has not been successfully demonstrated in space. At the conclusion of this Phase II contract, the KGS ASM will be ready to go to space qualification testing and then a demonstration launch, where KGS will have the opportunity to prove the ASM's capability in the target environment.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Kymeta Government Solutions	Lead Organization	Industry	Redmond, Washington
● Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations	
Maryland	Washington

Project Transitions

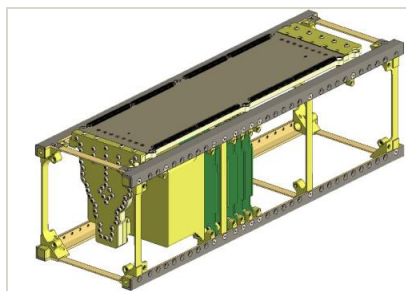
▶ **June 2017:** Project Start

✓ **October 2018:** Closed out

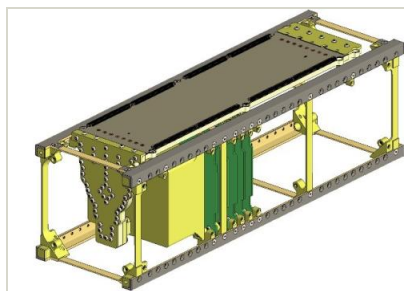
Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/140902>)

Images

**Briefing Chart Image**

Ka-Band Electronically Steered CubeSat Antenna, Phase II Briefing Chart Image
(<https://techport.nasa.gov/image/130069>)

**Final Summary Chart Image**

Ka-Band Electronically Steered CubeSat Antenna, Phase II
(<https://techport.nasa.gov/image/135450>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Kymeta Government Solutions

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

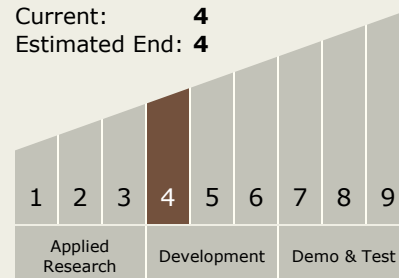
Carlos Torrez

Principal Investigator:

Margaret R Godon

Technology Maturity (TRL)

Start: 4
Current: 4
Estimated End: 4



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Technology Areas

Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
 - └ TX05.2 Radio Frequency
 - └ TX05.2.6 Innovative Antennas

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System